

**RESEARCH COPY**  
**PATENT SPECIFICATION**

**680,715**



Date of filing Complete Specification: April 11, 1950.

Application Date: April 21, 1949. No. 10548/49.

Complete Specification Published: Oct. 8, 1952.

Index at acceptance:—Classes 140, A2(d: x), E1(a: b: h: m); and 141, G2d.

**COMPLETE SPECIFICATION**

**Improvements in Articles Providing Protection against X-Rays**

We, DUNLOP RUBBER COMPANY LIMITED, a British Company, of 1, Albany Street, London, N.W.1, and LEONARD CROMPTON, a British Subject, of 6 the aforesaid Company's Works at Cambridge Street, Manchester, do hereby declare the invention, for which we pray that a patent may be granted to us and the method by which it is to be 10 performed, to be particularly described in and by the following statement:—

This invention concerns articles for providing protection from X-rays.

It is known to make articles, e.g. 15 curtains and clothing such as gloves or aprons, from rubber compositions in which is dispersed a material comprising an element of high atomic number; materials which have been used include 20 lead powder, compounds of lead e.g. litharge or lead carbonate, and compounds of barium such as barium sulphate. These materials have a high stopping power for X-rays and thus the 25 articles give protection to operators working with X-rays.

It is an object of the present invention to provide novel articles affording protection against X-rays.

According to the present invention a 30 novel composite article affording protection against X-rays comprises at least one layer of lead glass fabric and one or more layers adherent thereto made of a 35 rubber or a synthetic resin composition.

Advantageously the composition contains dispersed therein a material comprising an element of high atomic number e.g. lead or barium.

In the known type of articles in which 40 X-ray protection is due solely to the material comprising atoms of high atomic number dispersed in rubber, there is a limit to the amount of the material which 45 can be introduced without adversely affecting other desirable physical qualities of the rubber e.g. flexibility and

strength. In the present invention, the layer of lead glass fabric increases the strength of the article and is itself capable 50 of affording X-ray protection. Thus improved articles affording protection to X-rays can be made particularly if the rubber or synthetic resin composition also contains a material comprising an element of high atomic number having a 55 high stopping power for X-rays.

The invention is applicable to a variety of articles, as for example curtains or tubes, but it is of particular advantage for 60 the production of clothing to be worn by X-ray operators, as for example gloves, gauntlets or aprons.

In one embodiment of our invention, 65 gloves have an innermost layer of knitted fabric, e.g. stockinette, covered with flexible rubber or synthetic resin composition in which is embedded one or more layers of lead glass fabric. The gloves may be made by a dipping process; in this 70 method a stockinette glove-shaped lining is stretched over a former, covered with rubber by one or more dips into a latex composition containing vulcanising ingredients, each layer thus deposited being 75 allowed to dry before the next dipping. A layer of lead glass fabric, previously cut to the desired shape, is applied to the coating and then a further coating of latex composition is applied by dipping again. One or more layers of glass fabric 80 may be applied in this way with intermediate layers of latex composition to form a bond between the various layers of fabric. A final dip in latex composition is 85 given, and after this last layer has been allowed to dry the whole is vulcanised by heating in a suitable manner. Instead of dipping in a latex composition, the glove may be built up by dipping in a solution 90 of rubber containing suitable vulcanising ingredients.

According to another method of producing gloves in accordance with the inven-

**BEST AVAILABLE COPY**

tion, a preformed composite material having a layer of lead glass fabric and a layer of rubber adherent thereto is cut into pieces of appropriate shape and the pieces 5 hand-sewn together in pairs to form gloves; the edges are then covered with a tape of a lead glass fabric proofed with rubber composition, the tapes being secured over the sewing by a rubber adhesive cement or bonded to the material of the gloves in any other appropriate manner.

The lead glass fabric may be made from lead glass containing the usual lead content, e.g. 25% to 50% lead oxide, and the rubber may be either a natural or a synthetic rubber. It is also possible to employ, instead of the rubber, a synthetic resin composition comprising e.g. polyvinyl chloride or a co-polymer of vinyl chloride and vinylidene chloride. Preferably these compositions, whether of rubber or of a synthetic resin, contain lead powder or a compound of lead or 10 barium, e.g. litharge, lead carbonate, barium carbonate or a mixture of these, to provide improved protective power against X-rays.

Articles such as aprons and curtains 15 may be made by spreading on one or both sides of a lead glass fabric a vulcanisable rubber composition or a synthetic resin composition of polyvinyl chloride or other suitable synthetic resin, or by assembling

more than one layer of the lead glass 35 fabric with intermediate and outer layers of rubber or synthetic resin composition bonded thereto; vulcanisation is effected subsequently if a vulcanisable composition has been used. Preferably also one or 40 more of the layers of rubber or synthetic resin contain lead compounds or barium compounds dispersed therein to provide additional X-ray protection. The sheets, having been made in this way, may be 45 cut to shape for aprons or curtains as desired, and the necessary tapes, fastening means and the like accessories attached.

What we claim is:—

1. A composite article affording protection against X-rays comprising at least one layer of lead glass fabric and one or more layers adherent thereto made of a rubber or a synthetic resin composition. 50
2. An article according to Claim 1 comprising a layer of lead glass fabric enclosed in a rubber or a synthetic resin composition. 55
3. Gloves or gauntlets according to Claim 2 having an innermost layer of 60 knitted fabric.
4. Articles according to any of Claims 1 to 3 in which the said composition contains lead powder or a compound of lead or barium dispersed therein. 65

G. W. I. SHEAVYN,  
Agent for the Applicants.

#### PROVISIONAL SPECIFICATION

#### Improvements in Articles Providing Protection against X-Rays

We, DUNLOP RUBBER COMPANY LIMITED, a British Company, of 1, Albany Street, London, N.W.1, and LEONARD CROMPTON, a British Subject, of 70 the aforesaid Company's Works at Cambridge Street, Manchester, do hereby declare the nature of this invention to be as follows:—

This invention concerns articles for 75 providing protection from X-rays.

It is known to make articles, e.g. curtains and clothing such as gloves or aprons, from rubber compositions in which is dispersed a material comprising 80 an element of high atomic number; materials which have been used include lead powder, compounds of lead e.g. litharge or lead carbonate, and compounds of barium such as barium sulphate. These 85 materials have a high stopping power for X-rays and thus the articles give protection to operators working with X-rays.

It is an object of the present invention

to provide novel articles affording protection against X-rays. 90

According to the present invention a novel article affording protection against X-rays comprises a layer of lead glass fabric and a layer adherent thereto of rubber or a synthetic resin composition. 95 Advantageously the composition contains dispersed therein a material comprising an element of high atomic number e.g. lead or barium.

In the known type of articles in which 100 X-ray protection is due solely to the material comprising atoms of high atomic number dispersed in rubber, there is a limit to the amount of the material which can be introduced without adversely 105 affecting other desirable physical qualities of the rubber e.g. flexibility and strength. In the present invention, the layer of lead glass fabric increases the strength of the article and is itself capable of affording X-ray protection. Thus, 110

particularly if the rubber or synthetic resin composition also contains a material comprising an element of high atomic number, improved articles affording protection to X-rays can be made.

The invention is applicable to a variety of articles, as for example curtains or tubes, but it is of particular advantage for the production of clothing to be worn by 10 X-ray operators, as for example gloves, gauntlets or aprons.

In one method of carrying out our invention, gloves are made having an innermost layer of stockinette covered with a 15 rubber or synthetic rubber composition in which is embedded one or more layers of lead glass fabric.

The gloves may be made by a dipping process; in this method a stockinette 20 glove-shaped lining is stretched over a former, covered with rubber by one or more dips into a latex composition containing vulcanising ingredients, each layer thus deposited being allowed to dry 25 before the next dipping, a layer of lead glass fabric, previously cut to the desired shape, is applied to the coating and then a further coating of latex composition is applied by dipping again. One or more 30 layers of glass fabric may be applied in this way with intermediate layers of latex composition to form a bond between the various layers of fabric. A final dip in latex composition is given, and after this 35 last layer has been allowed to dry the whole is vulcanised by heating in a suitable manner. Instead of dipping in a latex composition, the glove may be built up by dipping in a solution of rubber containing suitable vulcanising ingredients. 40 In a further form of the invention; a pre-formed composite material having layers of rubber and lead glass fabric may be cut into pieces of appropriate shape and the 45 pieces hand-sewn together in pairs to form

gloves; the edges are then covered with a tape of a lead glass fabric proofed with rubber composition, the tapes being solutioned over the sewing, or bonded to the material of the glove in any other appropriate manner.

The lead glass fabric may be made from lead glass containing the usual lead content, e.g. 25% to 50% lead oxide, and the rubber may be either a natural or a synthetic rubber. It is also possible to employ, instead of the rubber, a synthetic resin composition comprising e.g. polyvinyl chloride or a co-polymer of vinyl chloride and vinylidene chloride. Preferably these compositions, whether of rubber or of a synthetic resin, contain lead powder, litharge, lead carbonate barium carbonate or a mixture of these, to provide improved protective power 55 against X-rays.

Articles such as aprons and curtains may be made by spreading on one or both sides of a lead glass cloth a vulcanisable rubber composition or a synthetic resin composition of polyvinyl chloride or other suitable synthetic resin, or by assembling more than one layer of lead glass cloth with intermediate and outer layers of the rubber or synthetic resin composition; vulcanisation is effected subsequently if a vulcanisable composition has been used. Preferably also one or more of the layers of rubber or synthetic resin contain lead compounds or barium compounds dispersed therein to provide additional X-ray protection. After the sheets have been made in this way they are cut to shape for aprons or curtains as desired, and the necessary tapes, fastening means and the like accessories attached.

Dated this 14th day of April, 1949.

G. W. I. SHEAVYN,  
Agent for the Applicants.

Leamington Spa: Printed for Her Majesty's Stationery Office, by the Courier Press.—1952.  
Published at The Patent Office, 25, Southampton Buildings, London, W.C.2, from which  
copies may be obtained.

RECORDED COPY